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U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
Division of Forest Insect Research

DOUGLAS-FIR BEETLE
SIX RIVERS AND KLAMATH NATIONAL FORESTS
JULY 1954
RECONNAISSANCE SURVEY

INTRODUCTION

During late June and July, reconnaissance surveys of damage by the Douglas-fir beetle (Dendroctonus pseudotsugae Hopk.) in Douglas-fir were made from both air and ground on parts of the Six Rivers, Klamath and Shasta-Trinity National Forests and the Hoopa Valley Indian Reservation. The surveys were undertaken in response to a query from the Forest Service Regional Office in San Francisco, for information concerning the extent and seriousness of Douglas-fir beetle damage which had been observed in the Orleans District, Six Rivers National Forest. They were made by the writers, with the help of local personnel from the Six Rivers and Klamath National Forests and the Hoopa Valley Indian Reservation. A plane and pilot were made available by the Forest Service Regional Office for the aerial phases of the work.

AERIAL RECONNAISSANCE

The aerial reconnaissance of damage by the Douglas-fir beetle was made by G. L. Downing, California Forest and Range Experiment Station, on June 29 and July 19 and 20. Ranger Charles A. Yates and M. J. Knight of the Orleans District, Six Rivers National Forest, accompanied Downing on the flights and acted as observers. Red Turner of the Forest Service Regional Office was the pilot on all flights. The general area covered included parts of the Six Rivers, Klamath, and Shasta-Trinity National Forests. The purpose of the aerial examination was to determine the general nature and extent of Douglas-fir beetle damage, and to secure some idea of the magnitude of the problem.

Area covered and methods used.--From the first flight made on June 29, it became apparent that the infestation covered a much larger area than had been anticipated; therefore, subsequent flights were made on July 19 and 20 in order to more adequately cover the entire infested area. During this period, the following areas were reconnoitered: West part of the Happy Camp and parts of the Salmon River Districts (both on the Klamath National Forest); the Orleans, Lower Trinity, and parts of the Gasquet Districts (of the Six Rivers National Forest); and a small section of the Hay Fork District (Shasta-Trinity National Forest).

This was the first attempt in California to map any large forest insect infestation from the air; therefore, the technique used at the outset was improved as the flights progressed. Following is a description of the method that was evolved: Flights were made over each drainage; any groups of infested trees noted were mapped and a tally of the groups was made. The author counted the

groups and mapped the infested areas as they were flown, relying upon the District personnel present on each flight for ground locations. In flying the areas, one drainage at a time was worked, progressing from drainage to drainage until there was no longer any infestation noticeable. In some areas, particularly along the border between Oregon and California, large areas were covered in which no infestation was noticeable. Due to cloudy weather which prevailed along the coast at this time of the year, it was not possible to obtain complete coverage on all drainages; however, it is believed that very little of the infestation was missed because of this.

Approximately 10 hours were devoted to the actual aerial survey, and some 8 hours to ferry time to and from Oakland. Two different planes, both Forest Service owned, were used. On the first flight of June 29, a Ryan Navion was used. On the second series of flights, a Beechcraft Bonanza was used. Both planes are low-winged and have similar flight characteristics, with cruising speeds of around 150 miles per hour and capable of flying at speeds between 100 and 110 miles per hour for aerial mapping work. Most of the mapping was done at elevations between 400-700 feet above ground level. The Navion proved to be the better of the two planes for this type of work. Downward visibility on the Bonanza is too restricted for use on surveys of this type. Neither plane, however, is as well suited to forest insect survey needs as aircraft of the high wing type, such as the Cessna 180.

Results of Aerial Reconnaissance.--A summary of the areas in which Douglas-fir beetle infestation was found is given in the Appendix of this report. Approximately 1,052 groups of beetle-killed trees were counted in a gross infested area of 200,000 acres. This does not include single trees and many small groups of 2 or 3 trees which could not be tallied; hence, the figure given is believed to be conservative. It was impossible to secure a satisfactory count from the air of the number of trees per group, to provide a basis for an average; but it appeared that the average would be within the range of 10-15 trees. Some groups were noted which were quite large in extent, probably containing 50 to 100 or more trees. For the gross area infested, indications are that the concentration of loss per acre is not especially large. In many areas, however, the groups of infested trees are confined to small basins of timber, and in these basins the loss per acre is probably considerable.

Efforts were made to detect evidence of windthrown timber from the air, since the Douglas-fir beetle is believed to breed up in such material prior to outbreaks in standing timber. Moreover, it is known that serious losses due to high winds occurred during the winter of 1951-52 in Douglas-fir stands in southern Oregon, to the north of the area examined. No serious damage from windthrow could be seen; however, local Forest Service personnel pointed out that in certain areas current Douglas-fir beetle activity coincides quite closely with windthrow damage noted on the ground during the course of road and trail construction.

GROUND RECONNAISSANCE

A ground reconnaissance of parts of the infested area disclosed by the aerial survey to contain groups of beetle-killed trees was made by R. C. Hall and C. B. Eaton, California Forest and Range Experiment Station during the week of July 26-30. Contacts were made with Ranger Charles A. Yates, Orleans District,

Six Rivers National Forest; Ranger H. H. Scherer, Happy Camp District, Klamath National Forest; and H. Courtney, Forester for the Hoopa Valley Indian Reservation to discuss the Douglas-fir beetle infestation within their respective territories and secure advice as to access to areas where ground examinations could be made.

Area covered and methods used.--A considerable amount of territory was covered during this trip to determine if ground observations on the general extent of beetle damage were consistent with the findings of the aerial reconnaissance. Routes were traversed through the western part of the Shasta-Trinity, Six Rivers, Klamath, and southern tip of the Siskiyou National Forests, as well as the Hoopa Valley Indian Reservation.

The second objective of the ground survey was to secure information on the status of the infestation, and some preliminary data regarding the number and volume of trees per group, the relative amount of 1954 as compared with 1953 kill, and the relative abundance of windthrown timber in relation to current beetle activity. This work was limited to the two Ranger Districts and the Indian Reservation referred to above.

Most of the area within which the current infestation occurs is extremely rugged, and systematic cruising of loss is a time-consuming process. For this reason, no attempt was made to measure the loss in relation to area. Instead, road strips were run along such truck trails as were available, into drainages where damage had been mapped from the air. All groups of infested trees that could be reached were examined. The location of each group was logged, diameters of infested trees measured by tape, the year of kill noted, and the number and size of recent windfalls, if any, recorded. No attempt was made to tally single trees seen, although a number were noted in the survey.

Results of ground reconnaissance.--Observations made during the extended ground reconnaissance corroborated the findings of the aerial survey as to the general location of current Douglas-fir beetle outbreaks and the areas in which they are concentrated. Toward the northern end of the Klamath and in the southern tip of the Siskiyou National Forests, very little beetle damage was seen. This was also true toward the coast, where Douglas-fir commonly occurs in mixture with the coast redwood. Group kills frequently were observed in the Orleans District (Six Rivers N. F.) and in the southern part of the Happy Camp District (Klamath N. F.), as well as along the northeast edge of the Hoopa Valley Indian Reservation. The territory south of the Reservation on the Lower Trinity District of the Six Rivers N. F. was not examined.

Signs of old loss in Douglas-fir were somewhat variable, but no widespread wind damage or excessive group killing due to previous beetle outbreaks was seen. There is little or no evidence that the beetle has been unusually active in Douglas-fir stands of northwestern California in recent times, prior to the current outbreak.

The data obtained from examinations of beetle-killed groups of trees which were infested or killed within the last two years are summarized in Table 1. Thirteen groups were examined containing a total of 181 trees and a gross volume

of 631,240 board feet. Ten of these trees are windthrows, which were associated with four of the groups inspected. The remainder are 1953 or 1954 beetle-killed trees. The average volume per tree is 3,488 board feet, and the average number of trees per group, excluding windthrows, is 13, with a range of 3 to 50. On the basis of volume, 46 per cent of the total insect-caused loss is due to 1953 attacks and 54 per cent to 1954 attacks. At the time of this survey, most of the trees infested this year were green or just beginning to fade.

Table 1. Volume [1/] and Number of Dead Trees in Douglas-fir Beetle-infested Groups Sampled
Six Rivers and Klamath National Forests
July 1954

Area	Route and Group Number	Windthrown		Insect Killed 1953		Insect Killed 1954		Total	
		No.	Vol.(BF)	No.	Vol.(BF)	No.	Vol.(BF)	No.	Vol.(BF)
Orleans	Cedar Camp Rd. 1	2	7,990	9	56,100			11	64,090
	2			3	13,450	9	49,050	12	62,500
	3	2	6,200	3	8,400	4	17,240	9	31,840
	4			8	59,300	3	15,040	11	74,340
	5			2	6,500	3	32,980	5	39,480
Happy Camp	6			8	46,850			8	46,850
	8			1	5,500	5	14,930	6	20,480
	Elk Creek Rd. 1			11	5,460	39	22,800	50	28,260
	2			7	23,230	2	11,980	9	35,210
	3	5	10,930	4	6,290	1	2,710	10	19,930
	4	1	2,390	6	16,130	26	76,510	33	95,030
Orleans	French Camp Ridge 1					3	8,270	3	8,270
Hoopa	Mill Creek Rd. 1			4	32,660	10	72,300	14	104,960
TOTAL	13	10	27,510	66	279,920	105	29,591	181	631,240
Average volume per tree			2,751		4,241		2,818		3,488
Average (excl. windthrows)				5	21,532	8	24,908	13	46,445
Per cent of total					46		54		100

1/ Volumes gross from Hornibrook's Table 3 - Site 1A & 1

DISCUSSION AND RECOMMENDATIONS

The combined results of the ground and aerial examinations serve to provide us with some conception of the nature of the infestation, the type of stands affected, and a rough idea of the magnitude of the damage. For the most part, losses are confined to virgin timber, much of which is of large diameter and mature or over-mature, and far removed from recent or current logging operations. Access to many of the drainages where damage occurs is limited to trails or is non-existent, and as previously stated, the terrain is rugged. Although it was at first believed that the origin of the present outbreaks was related to wind damage during the winter of 1951-52, which permitted beetle populations to breed

up in sufficient numbers to enable them to successfully attack standing green trees, this supposition was not borne out by ground observations. It is true that some wind throws have occurred throughout most of the infestation area, but they are not unusually abundant, and do not appear to be associated with group-killing. Furthermore, the tendency for many sizeable groups to occur in basins of timber rather than near ridge tops, where wind would be expected to cause the greatest havoc, does not indicate that this factor is important.

That the Douglas-fir beetle infestation is aggressive in character is indicated by the fact that the 1954 loss equals or exceeds last year's. Trees attacked this last spring are not as yet discernible except upon close examination, and for this reason the infestation will probably appear a good deal more alarming this fall when the crowns begin to fade and turn red. By the same token, the group counts obtained during the aerial survey can be considered to cover principally 1953 loss, since few of the 1954 groups can be detected from the air at this time on the basis of foliage discoloration. It is estimated that the 1052 groups observed from the air contained approximately 47,700,000 board feet. Since this is 1953 loss and is only 46 per cent of the total, the gross loss for 1953 and 1954 will probably be in excess of 103,000,000 board feet.

The foregoing is a rather broad picture of the situation. It is not possible to refine it further on the basis of present data, to determine which specific drainages or small management units are most seriously affected. To do so will require a good deal more ground and aerial work than is possible with the manpower available at this time. Further survey investigations probably should not be undertaken until after the trees infested this year begin to discolor - presumably this fall.

Direct control of the Douglas-fir beetle is not feasible in the general area in question, and is not recommended. Salvage in certain management units may offer some possibilities, either alone or in connection with existing or proposed timber sale plans. Most of the beetle-killed material will remain salvable for at least 3 years - possibly more. Therefore, certain areas can be salvaged as timber sales reach these areas, or cutting plans can be rearranged so that cutting in stands where damage is most severe will have priority over those in which losses are light.

Berkeley, California
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APPENDIX

The following is a brief summary of the infestation broken down by Forests and Ranger Districts:

SIX RIVERS N.F.

Gasquet Ranger District.--The east half of this district was flown and a few scattered groups were noted. However, there appears to be no immediate problem on this district. The west half of the district was not flown, owing to cloudy weather.

Orleans Ranger District.--

1. Heavy to very heavy loss in the upper reaches of the East Fork of Blue Creek.

2. Moderate to very heavy loss in the upper one-half of the Bluff Creek drainage.

3. Moderate to heavy loss throughout the Camp Creek drainage.

4. Heavy to very heavy loss in the Leary Creek and South Fork tributaries of Redcap Creek.

5. Moderate loss on the hillside south of the Orleans R. S.; on the north side of LePerron Peak; and on the north side of Blacks Mountain.

Lower Trinity Ranger District.--

1. Heavy loss along the south side of Tish Tong A Tang Creek. (Most of this is within the Hoopa Valley Indian Reservation.)

2. Moderate loss extending three to four miles east of the highway between Salyer and Coon Creek to the north.

3. Heavy to very heavy loss scattered throughout the Madden Creek and Grouse Creek drainages.

KLAMATH N.F.

Happy Camp Ranger District.--

1. Heavy loss in the lower one-half of the Clear Creek drainage.

2. Heavy to very heavy loss on the East Fork, Cougar Creek and Doolittle Creek tributaries of Elk Creek.

3. Moderate loss on Independence Creek, Buzzard Creek and Ukonom Creek.

4. Heavy loss on the Tea Creek drainage.

5. Moderate to heavy loss in the Swillup Creek drainage and in the tributaries of Dillon Creek between Sawtooth Mountain and Pony Peak.

6. Heavy loss throughout the Rock Creek drainage.

7. Heavy loss in the Halverson Creek drainage.

8. Moderate loss in the Reynolds Creek drainage.

9. Moderate loss in the Rogers Creek drainage.

Salmon River Ranger District.--

1. Moderate loss between Somes Mountain and the highway to the east of Somes Bar.

2. Moderate loss along the lower part of the Little North Fork of Uncle Creek and along Shitas Creek.

3. Moderate loss at the head of Nordheimer Creek, just to the north of Salmon Mountain.

TRINITY N.F.

Hayfork Ranger District.--No loss serious enough to warrant mapping was noted. Light scattered loss appears throughout the drainages to the west of the South Fork of the Trinity River, from Norris Butte on the south to Blake Mountain on the north.

HOOPA VALLEY INDIAN RESERVATION

This survey did not include all of the Indian Reservation, but covered sufficient of the area to indicate that losses are occurring in the northeast and southeast portions of the Reservation.